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CHINA: ENERGY SUPPLY PROBLEMS

OER Project No. 23.6796

25X1A

ANALYST :



BRANCH : Resources

DIVISION: China

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CHINA: ENERGY SUPPLY PROBLEMSConclusions

China's ambitious plans for expanding industrial production are running up against shortages of coal and electric power.

Coal, which accounts for nearly 80% of all primary energy produced in China, will continue to be in tight supply over the next several years. Recent increases in output have been possible only because existing facilities have been operated intensively, sometimes under conditions of rapidly diminishing returns. Construction of new modern mines has been insufficient to keep abreast of industry's ever-growing demand for coal.

Growth in production of electric power has been hampered not only by lack of coal but also by technological backwardness, lack of a unified transmission network (which would permit fuller use of installed capacity), and the remote location of many prime hydro-electric sites.

In contrast, the infant petroleum industry has been advancing rapidly from its small base and has recently become an earner of much-needed foreign exchange. As China's stock of industrial and transportation equipment continues to grow, and as China builds petro-chemical

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industries, domestic demand for petroleum will rise sharply. Nonetheless, petroleum will remain far behind coal in China's energy picture. Peking has neither the means nor the motivation to deliberately switch its industrial plant from coal to oil.

The government has not seen fit to make wholesale diversions of resources in an effort to ease the energy bind. Resources are needed elsewhere. In a series of major economic decisions in 1972-73, Peking acted to guarantee the stability of the agricultural sector by greatly increasing the import of grain and cotton, by contracting for a billion dollars worth of Western fertilizer and artificial fiber plants, and by relaxing its policy of no foreign debt to finance these purchases. Purchases of foreign mining and electric generating equipment -- while substantial by prior standards -- have had to play second fiddle to these other needs. Furthermore, a large portion of the equipment ticketed for the energy sector will not come into operation for several years.

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Discussion

Background

1. The PRC used an estimated 364 million metric tons (SEF* basis) of primary energy in 1973. China is in the same class as an energy consumer as Canada, Japan, West Germany, and Great Britain; only the United States and the Soviet Union use more. (See Graph 1) Industry is the main consumer of China's energy. Other users are the transportation, construction, communications, and military sectors. Except for austere use in domestic heating, lighting, and cooking, private consumption is negligible.

2. Coal accounts for almost 80% of all primary energy produced. It provides directly or indirectly 85%-90% of the power for industry, generates 75% of all electric power, provides almost all the heat for the urban population, and powers 80% of the railway locomotives. In addition, coal is a raw material for the rapidly developing chemical fertilizer and other petrochemical industries.

3. Other significant contributors to Chinese primary energy output are petroleum and hydro-electricity. The petroleum industry in 1973 provided about 19% of total primary energy output. Hydro-electricity's

* Standard Fuel Equivalent (Calorific Value of 7,000 kc per kg).

contribution to the total primary energy output in 1973 was probably 3%. China currently has no nuclear power plants.

Growing Energy Bind in 1973

4. In the 1950s, Soviet assistance coupled with a vigorous domestic push resulted in a rapid expansion of coal and electric power capacity. Then, in the 1960s, emphasis shifted to industrial branches such as electronics, metallurgy, chemicals, and armaments. The supply of coal and electric power has been tightening in recent years, particularly in 1973.

5. Practically no data on energy supplies surfaced in 1973. Evidence had to be read between the lines. Party Central Committeeman Tseng Ssu-yu admitted "tension" in coal and electricity supplies. The 1973 year-end claims of industrial achievements omitted mention of coal despite its fundamental importance. Similarly, national electric power output claims were restricted to a comparison with an unspecified 1965 base. "Coal conservation" campaigns -- a regular feature of the Chinese press for years -- also received unusual emphasis in 1973. During the year, the regime conceded that demand for anthracite and coking coal "could no longer be met". Some 300 plants representing 44% of China's total small nitrogenous

fertilizer plants were converted to use of locally produced coal as supplies of coal from large, national, mines dwindled. The City of Sian, despite its location near the major coal fields of North China, rationed coal for individual use during 1973.

6. The electric power industry, heavily dependent 25X1D on coal for fuel, began converting thermal power plants 25X1D from coal to oil or a coal-oil combination. [REDACTED]

25X1D [REDACTED] In addition to coal supply problems, electric power production was constrained by generally inadequate generating capacity and underdeveloped power transmission networks. China has only small regional grids and thus cannot improve operating efficiency by dovetailing the needs of different regions. Irregularities in electricity supply in urban areas, apparently caused by diversions of power from private to industrial use, continue to be reported. In Liaoning, one of the provinces most abundantly supplied with generating facilities, a form of rationing has been in force for agriculture as well as industry since 1970.

Coal Capacity and Output

7. From 1949 to 1973, coal production increased 25X1D from a mere 32 million tons to 378 million tons. China [REDACTED]

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now ranks third in world production behind the United States and the Soviet Union, as shown in the latest available figures:

Leading Coal Producers

	<u>1971</u>	<u>1972</u>
United States	503	529
USSR	441	451
China	335	357
Poland	146	151
United Kingdom	147	122
West Germany	111	103

25X1C

"foreign" substituted

8. [Chinese officials have told [redacted] visitors that the development of coal and petroleum resources is the fifth in a list of five priorities in the Fourth Five-Year Plan (1971-75).] The key word is "development". Unable to marshal the resources for the wholesale modernization of the coal industry, Peking has ordered more intensive exploitation of existing mines. Only a few large, modern, mines have been brought into production. The capacity of large new mines as a percent of national coal output of the preceding year is as follows: *

* See Appendix 3 for a listing of the new mines.

1969	2.8
1970	1.7
1971	unknown
1972	1.6
1973	0.6

9. Production of coal has been concentrated in the north and northeast, where the best quality deposits and most of the big industrial centers are located. Until a few years ago, enough coal came from the large northern mines to ensure supplies for important industries throughout most of China. As demand for coal began to exceed the capabilities of the northern mines, policy changed in 1969 to encourage exploitation of secondary coal deposits in all parts of China. The coal from secondary deposits -- mainly produced by small local mines -- reached 25% of national output in 1970 and may have been as much as 30% in 1973. Peking hopes that the southern provinces will develop enough new deposits to achieve self sufficiency in coal within the next few years.

10. In the period 1970-73 -- when Peking was stressing the more intensive working of existing mines and the opening of small mines -- the rate of increase of coal production fell behind the rate of growth of overall industrial output:

	<u>Coal</u>	<u>Industry</u>
1970	20.2%	17.9%
1971	8.1	12.7
1972	6.6	7.5
1973	5.9	8
1970-73 average	10.1	11.4

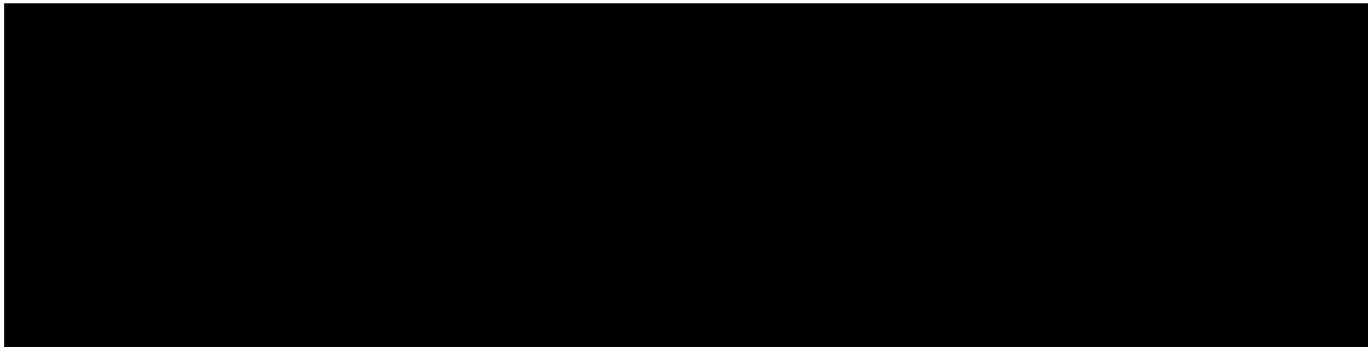
Coal-Mining Equipment

11. Chinese announcements highlight output of coal mining equipment rather than output of coal itself. Claims have included a gain of 68.9% in 1971 over 1970 in national production of coal mining equipment and a 78% increase in Shanghai's output in the first half of 1973 compared with the first half of 1972. These high percentage claims seem mostly the result of a start from a low base.

12. Peking began to seek coal-mining equipment from foreign suppliers in 1972. Since 1972, more than \$90 million of coal mining equipment has been imported.

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13. New domestic and foreign equipment at present translate mainly into more intensive exploitation of 25X6 existing mines. Added equipment cannot alter the reality that new underground mines require 4-7 years to build from scratch. Peking will not be able to overcome the tight coal situation by output from new modern mines for at least the next 5 years, even if they receive an immediate green light. Proved coal reserves pose no problem, being estimated at 70-80 billion tons. The Chinese make only small use of strip mining, although the geological formations in some parts of north China appear favorable. The Fushun and Fou-hsin areas of Manchuria each contains a large strip coal mine, and a new strip coal mine of unknown size was opened in Ninghsia Autonomous Region in the northwest during 1973.

Electric Power Capacity and Output

14. Since the Communist take-over of 1949, electric power output has increased more than 23 fold to an estimated 101 billion KWH in 1973. Electric power output

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more than doubled between 1965 and 1971. The rate of increase fell to 9.4% in 1972 and dropped further to 8.6 percent in 1973. This slowing down has paralleled the decline in the rate of increase in industrial output:

Annual Rate of Increase

	<u>Electric Power</u>	<u>Industry</u>
1970	20	21.7
1970	20	17.9
1971	18	12.7
1972	9.4	7.5
1973	8.6	8
1970-73 average	13.8	11.4

15. In 1973, about 10 percent of the total national coal output was needed to generate about 75 percent of national electric output. An increase in the share of coal given to the power industry would have to be at the expense of other sectors, such as the chemical and iron and steel industries. The share of electric power generated by oil-fired plants -- presently about 15% of the major powerplants -- cannot be increased overnight or without incurring heavy capital expenses.

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19. Under-developed transmission networks prevent a region experiencing light demand from helping an overloaded neighboring region. China is forced to maintain unusually large numbers of stand-by generating units as a consequence. The 11 or more gas turbines bought from John Brown and Company, Scotland, since 1972 apparently have been put to stand-by use in the Peking area.

20. The sparsity of transmission lines also means that most rural areas are left to their own resources to obtain power for pumping, threshing, small industries, lighting, and public radio listening posts. Only a few of the major river basins have power grids to tap electricity from urban power plants for farm tasks. Most of rural China depends on the 500,000 small hydro-electric stations built and operated by the various localities. These stations are 1 to 500 KW in installed capacity with the average size running around 30 KW. They provide marginal quantities of electricity where none would otherwise be available and enable Peking to claim that the majority of rural areas are "electrified". Their shortcomings, in addition to being severely restricted in output, are low mechanical reliability and vulnerability to seasonal changes in water flows.

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16. The electric power industry is bumping up against major technological obstacles to further rapid growth. For one thing, Chinese generating efficiency is far below world standards. In the United States the economies of scale possible with large generators have led to widespread use of 1,000 MW class generators. In contrast, Chinese claims center on 125 MW thermal and 300 MW hydro units as illustrations of the latest Chinese technological achievements. 25X1D Five plants are being equipped with 125 MW units produced in Shanghai, while one 300 MW hydro unit also built in Shanghai reportedly has been installed.

17. Chinese standards in power transmission are even lower than in generation. Transmission lines are limited to 220 KV systems with practical transmission distances of about 150 miles. One experimental line of 330 KV has been laid. In contrast, the U.S. commonly uses 500 KV lines which carry power 500-600 miles and is building 765 KV lines with a 1300-1400 mile range.

18. One U.S firm has concluded from its negotiations 25X1C with the Chinese for sales of power equipment that there are 30 or more "local" transmission grids in China.

Identified electric power networks are shown on the map in the Appendix.

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21. International experience suggests that rapidly growing economies should have a ratio of about 1:1.4 between the rate of growth of overall industry and of electric power.* The ratios for China in 1970, 1971, 1972, and 1973 have been 1:1.12, 1:1.42, 1:1.25, and 1:1.07 respectively. These ratios by themselves suggest insufficiency of electric power during those years. With the concurrent problem of inefficient long-distance power transmission in China, recurrent local and regional power shortages were to be expected. 25X1C

22. [REDACTED]

Ten percent is about the rate achieved during 1972, when the rate of overall industrial growth attained was 7.5 percent. The delegation's statement implies that Chinese industrial growth will continue to increase at these rates for at least a few years to come, in contrast with the 20 percent achieved in 1969 and in 1970.

Role of Oil

23. China, one of the few major nations with adequate supplies of oil, has boosted production from 5 million tons

* The relationship between industrial production and electric power production in 1961-65 in 12 countries shows that electric power increased at a faster rate -- 1.4 times on the average -- than industrial production in all countries.

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(100,000 b/d) in 1960 to 53 million tons (1,000,000 b/d) in 1973. Oil is now being used as a ready source of foreign exchange. Exports to Japan in 1973 average 20,000 b/d and may reach as much as 100,000 b/d in 1974. Rather than undergo the formidable costs of a wholesale shift from coal to oil in generating electric power at home, Peking is making the sound decision of selling oil to Japan, which has an almost insatiable need for petroleum as an industrial fuel. Higher export earnings will increase China's ability to purchase industrial equipment, including equipment to ease its tightening energy situation.

Imports of Foreign Power Equipment

24. Appendix 2 lists Chinese purchases since 1972 of equipment for the coal, electric power, and petroleum industries. The largest number of purchases has been in the field of electric power. As of the end of January 1974, more than \$150 million had been spent on at least 9 purchases of generating equipment and plants. Negotiations were underway on at least 18 more deals valued at over \$366 million. The equipment and plants bought up to now have been types within Chinese capability to build. The items under negotiation, however, include large-scale generating units and atomic power facilities which exceed current Chinese design and manufacturing capabilities.

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Chinese requirements for new generating equipment will outrun domestic production by an estimated 1,000 MW a year by the end of the decade.

25. Since 1972 China has bought more than \$90 million of coal mining equipment from Great Britain, Germany, and the U.S. All purchases have involved equipment used directly in the cutting of coal from seams and its conveyance out of the mines. The bulk of this mining equipment can be manufactured by the Chinese themselves.

26. Imports of petroleum equipment since 1972 total more than \$178 million. Except for exploitation of deep, offshore oil deposits, China has demonstrated that it does not require much foreign help in promoting rapid growth in the petroleum industry.

27. At present, grain and cotton imports, and imports of chemical fertilizer and synthetic fiber plants and equipment enjoy the highest priority in Peking's use of scarce foreign exchange. Imports of machinery for the fuel and power industries are on a highly selective basis.

More Hydro-electricity?

28. China's estimated hydro-electric potential of over 500 million KW is 17 times the existing national installed capacity, hydro and thermal combined. Less than one percent of the potential has been tapped. Suitable

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sites tend to be concentrated in the west where industrial consumers of electricity are few. In addition, seasonal fluctuations in water flow threaten damage to dams during the high seasons and lead to inadequate water levels for generation purposes during the low seasons. Storage reservoirs to even out annual flows run up the complexity and costs of projects.

25X1D 29. The Yellow River, a prime candidate for hydro development because of its proximity to many industrialized areas, presents another problem -- an annual average of over 40 billion cubic feet of silt.

25X1D [REDACTED] D
An "experimental" project said to be underway on the middle reaches of the river may be a new attack on the silt problem.

30. In summary, the problems of water flow, location and costs preclude water power as a solution to energy problems in the short-run. The regime has shown little enthusiasm to move in this direction. Large projects started as far back as the 1950s have yet to be completed. For new projects, Peking says only that a "batch" of large hydro-electric stations are being constructed, designed,

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or surveyed on the Yellow River. The share of hydro equipment in total EP generating capacity thus is likely to fall below the present 30%.

Atomic Power Plants

25X1D 30. Peking may soon buy an atomic power plant in the 600 MW range from a West German or American firm.

25X1D [REDACTED] Atomic power plants, even if started now, could not come on stream until the turn of the decade. China is unlikely to have an appreciable number of such plants until well beyond that time.

APPENDIX 1

China: Electric Power, Coal, and Petroleum Estimates

<u>Year</u>	<u>EP Output</u> billion <u>KWH</u>	<u>EP Installed</u> Capacity million <u>KW</u>	<u>Average</u> annual hours of use	<u>Coal Output</u> million <u>MMT</u>	<u>Crude Oil</u> output <u>MMT</u>	<u>SFE</u> <u>mmt</u>
1949	4.3			32.4		
1950	4.6			42.9		
1951	5.8			53.1		
1952	7.3			66.5		
1953	9.2			69.7		
1954	11.0			83.7		
1955	12.3			98.2		
1956	16.6			110.4		
1957	19.3			130.7		
1958	28			230		
1959	42			300		
1960	47			280		
1961	31			170		
1962	30			180		
1963	33			190	6.4	
1964	36			200		
1965	42	13.7	3066	220	10.8	
1966	50	17.5	2857	248		
1967	45	19.3	2331	190		
1968	50	20.8	2403	205		
1969	60	24	2500	258	20.3	
1970	72	25.6	2813	310	28.6	305.5
1971	85	26.3	3232	335	36.7	337.3
1972	92	27.4	3357	357	42.6	371.2
1973	101	28.8	3507	378	53.3	398.1

APPENDIX 2

Chinese Dealings in Electric Power, Coal Mining, and Oil Drilling Equipment
1972-4

<u>Country</u>	<u>Company</u>	<u>Equipment</u>	<u>Value</u>	<u>Notes</u>
<u>Coal</u>				
West Germany	Hemscheidtwerk	Mechanized coal face equipment	\$13.7 million	Sold Oct-Nov 7
West Germany	Eickhoffwerk Bochum	Fully mechanized coal face equip.	unknown	10 contracts Sep-Oct 73
Great Britain	Dowty Mining	Coal cutters, conveyors, roof & ground support equipment, signalling equipment, cables, methanometers	\$30 million	Sold Jul 73
Great Britain	Dowty Mining	Mining machinery	\$5.18 million	Dec 73 contract
Great Britain	Gullick-Dobson	Shearers, conveyors, signalling equip. long-wall roof supports	\$20 million	Sold Jun 73
USA	Bucyrus Erie	Electric shovels, blasting drills	\$20 million	Contract due Dec 73
USA	Reed Tool	Rock bits	\$1 million	Sold Jan 74

<u>Country</u>	<u>Company</u>	<u>Equipment</u>	<u>Value</u>	<u>Notes</u>
<u>Electric Power</u>				
France	Alsthom et Creusot-Loire	Two Kaplan turbine hydro- electric stations	\$10 million	Sold late 72
France	Alsthom, Paris	A 300 MW coal and fuel oil power plant	unknown	Jun 73 intend send delegation to Peking for discussions
France	Licensee of U.S. company	600 MW coal boiler	unknown	Negotiating as of Dec 73
France- Germany	CEM and Sulzer	300 MW power plant	unknown	Proposal to Peking Nov 73
Germany	Maschinenfabrik, Ausborg-Nurnberg	A 300-600 MW steam power station	unknown	Proposal sent to China Jan 73
Germany	AEG-Kanis Turbinenfabrik	25 MW gas turbines	unknown	To see visiting Chinese delega- tion Jan-Feb 73

<u>Country</u>	<u>Company</u>	<u>Equipment</u>	<u>Value</u>	<u>Notes</u>
<u>Electric Power</u> (continued)				
Germany	Demag A.G.	Cracked gas compressors with steam turbines	unknown	Nov 73 contract
Germany	Kraftwerk Union A.G.	300 MW brown coal plant	unknown	Engineers in China late 73 to discuss plans
Great Britain	John Brown	Eleven 20 MW gas turbines	\$18 million	Negotiations for first 5 concluded Feb 72
Great Britain	John Brown	15 gas turbine generators	\$26.4 million	Offered Dec 73
Italy	Gruppo Industrie Electromecaniche per Imperianti	A 125 MW steam turbine, associated condensers, heat exchangers, cycle tubing	\$8.8 million	Sold Dec 72
Italy	GIESTER	300 MW power plant	unknown	Proposal to Peking Sep 73

<u>Country</u>	<u>Company</u>	<u>Equipment</u>	<u>Value</u>	<u>Notes</u>
<u>Electric Power</u> (continued)				
Italy	Licensee of U.S.Co.	Two 320 MW coal boilers	\$20 million	Contract late 73
Japan	Hitachi	Two thermo power plants of total 250 MW capacity	\$15 million	Aug 72
Japan	Hitachi	Two 135 MW steam turbine generators	\$15 million	May be same as sale of Aug 72
Japan	Hitachi	Two thermo power plants	\$71.7 million	Sep 73
Japan	Fuji Electric	200-300 MW generators	unknown	Negotiating 73
Norway	Vaapenfabrikken Kongsberg	At least one KG 2-3H gas turbines	unknown	Sold prior to Jun 73
Sweden	Karlstade Mekaniska Verkstaeder and ASEA	Three sets of generators for HE stations	\$5.9 million	Sale announced Jul 73
Sweden	Allmana Svenska Elektriska Aktiebolaget (SAEA)	Hydro-turbine generator sets	unknown	Offered to Chinese Jul 73

<u>Country</u>	<u>Company</u>	<u>Equipment</u>	<u>Value</u>	<u>Notes</u>
Electric Power (continued)				
Switzer- land	Brown-Boveri-Sulzer Turbomaschinen (BST) Zurich	Ten steam driven process compressor packages	\$10 million	Possibly sold Dec 72
USA	General Electric	A 650 MW thermal power station	\$60 million	Responding to a Chinese proposal
USA	General Electric	A 300 MW and 600 MW steam turbine	unknown	Responding to a Chinese proposal
USA	General Electric	Modern gas turbine plant for manu- facturing 25 MW and 50 MW turbines	\$70 million over 10 yrs	Responding to a Chinese proposal
USA	General Electric	600 MW range nuclear power plant	\$200 million	Detailed pro- posal drawn up in response to Chin. request
USA	General Electric	A 300,500, and 600 MW coal boiler	unknown	Chin.requested proposal late
USA	Westinghouse	Three W-1101 gas turbine generators	unknown	Jan 74 contrac signing expect
USSR		Four steam turbines	unknown	Sold 72

<u>Country</u>	<u>Company</u>	<u>Equipment</u>	<u>Value</u>	<u>Notes</u>
PETROLEUM				
Denmark	WECO Shipping	Eight oil rig support vessels for servicing deep-sea oil rigs	\$20 million	First unit due China early 74
France	Compagnie Generale Geophysique	Services of a seismic vessel with crew	\$2 million	Sep 73 contract
W.Germany	Demag AG	Compressors for refineries and petro-chemical plants	\$1.15 million	Sold Dec 73
Holland	N.V. Industriele Handelscombinat	Four trailing suction hopper dredges	\$39.3 million	Contract signed early 73
Japan	Japan Drilling Co.	Used offshore drilling rig	\$8.5 million	Sep 72
Japan	Asian Offshore Drilling	Jackus type offshore drilling rig		President of AOD to Peking in early 73 to negotiate
Japan	Nippon Kokan	Offshore 60cm oil pipeline		Consultations in Peking in 1973
Japan	Nippon Kokan	Eight self-propelled bucket dredges	\$53 million	Contract Jun 73
Japan	Nippon Steel, Mitsui, Teikoku Oil	Offshore 120 cm pipeline	unknown	Discussions in Peking Oct 73
Japan	Mitsubishi Heavy Industries	No. 2 Hakuryu used heavy duty drilling rig	\$21.4 million	Contract signed Dec 73
Japan	Hitachi Shipbuilding and Engineering	Five equipment-transport vessels for offshore drilling	unknown	Ordered autumn 73

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<u>Country</u>	<u>Company</u>	<u>Equipment</u>	<u>Value</u>	<u>Notes</u>
PETROLEUM (continued)				
Japan	Hitachi Shipbuilding and Engineering Co	Two 9,000 hp oversized tugboats	\$16.6 million	Ordered late 73
Japan	Sumitomo Shoji , Japan Marine Ind., Niigata Engineer- ing	Two ADS-IV diving systems and a 500-ton survey vessel	unknown	Order accepted prior to Jan 74
Japan	Tsurumi Precision Instruments	Two sets of STD to measure salt content, temperature, and depth of sea water	unknown	Order accepted prior to Jan 74
Italy	Breda Fucine Fucine Meridioni	Pipes, collars, kellys	\$5.6 million	Sold Aug 72

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<u>Country</u> <u>Petroleum</u>	<u>Company</u> (continued)	<u>Equipment</u>	<u>Value</u>	<u>Notes</u>
USA	U.S. Geospace	Seismic field system, playback system	\$5.6 million	Oct 73
USA	Dresser Industries	Drill bits and associated equipment	\$0.5 million	Dec 73
USA	Bucyrus Erie	Drilling rigs	unknown	negotiating
USA	Hughes Tool	Drilling bits	\$2.7 million	Late 73
USA	Rucker	20 Land blowout preventer stacks	\$2 million	Contract signed Dec 73

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NEW LARGE COAL MINES ANNOUNCED BY PRC (1969-73)*

<u>Province</u>	<u>Mine</u>	Annual Capacity (<u>mmt</u>)	<u>Notes</u>
Anhwei	Huai-pei	1	
Honan	Ping-ting-shan #6	0.9	
Hopeh	T'ang-shan	1	
	Cheng-feng	0.310	
	unknown	0.5	
	Sun-chuang	0.6	
	Ching-hsing-chia-chuang	0.65	
Hupei	Shengli	"large"	
Inner Mongolia	Hai-tai-shan	"large"	
	Wu-hu-shan	"large"	
Kansu	Yao-chieh Bureau	0.9	
	Tzu-yao	unknown	
Kiangsi	Tung-shan #1	"large"	
Kiangsu	Chung-shan	0.3	
	unknown	0.45	
Kirin	Yen-pien	"large"	
	Liao-yuan Bureau	0.45	
Kweichow	PLA-run	1.2	Produces coking coal
Liaoning	Hsiao-ming	0.6	
	Ta-lung	"large"	
Ninghsia	Ta-feng	unknown	Open-pit, anthracite

* Data for 1971 not available. Judging by the 3 mines announced during 1972 and 4 during 1973, the number of new mines for 1971 was probably less than half a dozen.

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<u>Province</u>	<u>Mine</u>	Annual Capacity (<u>mmt</u>)	<u>Notes</u>
Shansi	unknown	3	
	Kao-yang	1.2	
Shensi	Nan-k'ou	0.25	
Sinkiang	Ha-mi	"large"	

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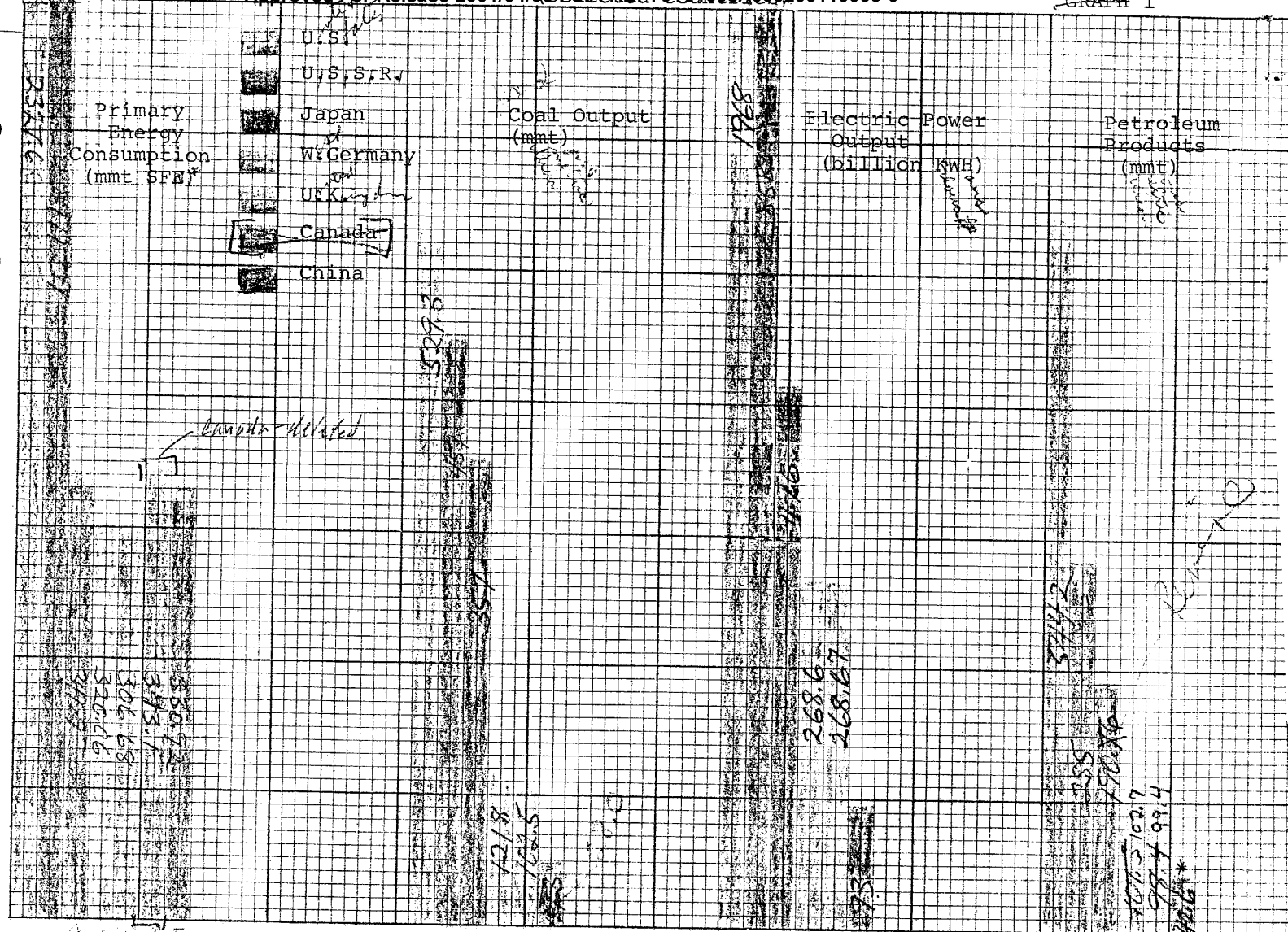
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A map of the known electric power
transmission grids in China.

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ENERGY COMPARISONS 1972

Figure 1
GRAPH 1



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TALENT-KEYHOLE

*Annotated
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Jma*

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